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HYDRICHTHYS PIETSCHI, NEW SPECIES, (COELENTERATA) PARASITIC ON THE
FISH, *CERATIAS HOLBOELLI*

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ABSTRACT: A new hydroid, *Hydrichthys pietschi*, was found on a myctophid fish, *Ceratias holboelli* Krøyer, collected off the leeward shore of Oahu, Hawaii. The basal plate of the hydroid erodes the pigmented epidermis and underlying tissues of the host. The literature on commensal and parasitic hydroids is reviewed.

Although the phenomenon is relatively rare, commensalism and parasitism involving hydroids and fish have been found in Russia (Ussow, 1887); Rumania (Dimitru, 1961); India (Alcock, 1893; Lloyd, 1907); Africa (Warren, 1916); European Atlantic Ocean (Damas, 1934; Jones, 1966); New England Atlantic (Fewkes, 1887, 1888; Gudger, 1928); Eastern Pacific (Heath, 1910; McCormick, Laurs, and McCawley, 1967); Japan (Franz and Stechow, 1908; Komai, 1932; Miyashita, 1941); New Zealand (Hand, 1961); and Hawaii (present paper). Some of these associations apparently are commensal without invasion of the host, with the polyps possessing tentacles and obtaining nourishment as do free-living species. Others are parasitic with invasion of the host, with polyps lacking tentacles and with reduction or loss of nematocysts. How the parasites obtain their food is of some interest. Warren (1916) reported that the non-tentacled polyps of *Hydrichthys boycei* ingested host red corpuscles and even connective tissue. Jones (1966) found that a hydroid, which he thought probably was *Ichthyocodium sarcotretis* Jungersen, 1911, attached to copepods, *Sphyrion lumpi* (Krøyer), parasitic on the redfish, *Sebastes mentella* Travin, fed on the fish hosts' blood and tissue. Damas (1934) suggested that the inner ectoderm of *Hydrichthys cyclothonis*, which is much thicker than the outer ectoderm, absorbed nutrients from the fish host, *Cyclothone signata* (Garman). The ribbon-like stolon of *Polypodium hydriforme*, which occurs in the ovarian eggs of certain

Russian and Rumanian sturgeons, must be nourished through its outer layer which is believed to be endoderm! The latter species has a remarkable life history with some aspects still unknown. The cycle has been reviewed by Raikova (1958), and Smol'yanov and Raikova (1961). A young stage invades the ovarian eggs of sturgeons in the Volga, neighboring rivers, and the Danube, then develops into a ribbon-like stolon which undergoes multiple budding. The buds form polyps by developing tentacles internally from the ectoderm, detaching from the stolon and turning inside out to bring the body layers to their usual position. After the fish spawns, the polyps and what remains of the stolon escape from ruptured eggs. The polyps usually bear 6, 12, or 24 tentacles (Lipin, 1909). Most polyps become male or female but a few are hermaphroditic. Eggs are released into the gastrovascular cavity. Male polyps, each bearing four testes near the aboral end, can become attached to small sturgeons. The ectoderm over each testis produces adhesive material which firmly attaches this area. Then the testes are released from the polyp and resemble buttons attached to the fish. After the four testes are released the polyp seems to disintegrate. Raikova (1965) used Feulgen cytophotometry to determine the deoxyribonucleic acid content of the various cells of this hydroid. Ectoderm and endoderm have the diploid content.

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The two nuclei of the "spermatids" are unequal, the smaller haploid (n), the larger 2 to 6 n . Nurse cells of the ovary are 8–32 n but the eggs are diploid when released. The youngest stage found in the sturgeon egg has two unequal nuclei, one about 400 n that forms a capsule around the embryo cells, and the other haploid. The early embryo cells also are haploid. This led Raikova to conclude that there is no fertilization and that diploidy is restored in later embryogenesis. Questions remain unanswered. If there is no fertilization, what role is played by "spermatids?" How is diploidy restored in later embryogenesis, etc.? It is apparent that further work needs to be done on this unusual type of development. Are sturgeons in parts of the world other than Russia and Rumania hosts of this parasite?

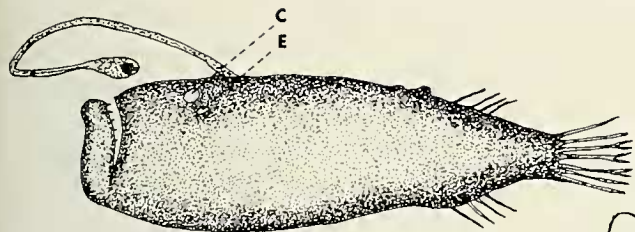
The assignment of specific names to such hydroids is difficult because of the relative paucity of diagnostic characters. If host specificity exists the problem would be greatly simplified. McCormick, *et al.*, (1967) argued against host specificity because they found presumably the same species of hydroid on two species of fish, *Tarletonbaenia crenularis* (Jordan and Gilbert, 1880) and *Diaphus theta* (Eigenmann and Eigenmann, 1890). Also they found the hydroid on a copepod, *Cardiodectes medusaeus* (Wilson, 1908) parasitic on *D. theta* and another fish, *Lampanyetus leucopsarus* (Eigenmann and Eigenmann, 1890). The attachment of the hydroid to a parasitic copepod may not be relevant to host specificity because Jones (1966) found that a hydroid attached to a copepod parasite still fed on the fish hosts' blood and other tissues. McCormick, *et al.*, (1967) examined more than 2000 Pacific specimens of the fish genus *Cyclothone* including *C. signata* without finding any hydroids. Yet Damas (1934) found 24 hydroid colonies on 21 of over 2000 *Cyclothone signata* from the Atlantic. If host specificity does not exist, why did not McCormick, *et al.*, find hydroids on *C. signata*? Warren (1916) also reported finding several species of fish hosts to *Hydrichthys boycei*. But again was only one species of hydroid in-

volved? In support of host specificity, Alcock (1893) found *Stylactis minoi* on the fish, *Minous inermis*, but not on *Minous coccineus* or other fish in the same trawl. Komai (1932) found this hydroid also only on *Minous inermis* in Japan. The following have been reported from only one species of fish: *Hydrichthys mirus* Fewkes, 1888 on *Seriola zonata*; *H. cyclothonis* Damas, 1934 on *Cyclothone signata*; *Podocoryne bella* Hand, 1961 on *Congiopodus leucopaecilus*; *Perigonimus pugetensis* Heath, 1910 on *Hypsagonus quadricornis*; *Stylactis piscicola* Komai, 1932 on *Erosa erosa*; *Nudicola monocanthi* Lloyd, 1907 on *Monocanthus tomentosus*; *Hydrichthys pacificus* Miyashita, 1941 on *Xesurus* sp. *Polypodium hydriforme* Ussov, 1885 parasitizes only sturgeons. It is possible, however, that a wider search might show more than one species of fish hosting the same hydroid. The question of host specificity has not been settled.

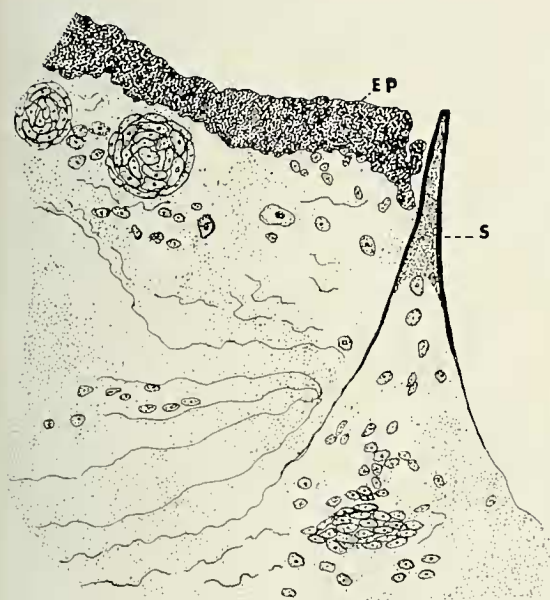
Ecological factors may determine whether or not a species of fish plays host to hydroids. Heath (1910) found twenty-five per cent of the fish, *Hypsagonus quadricornis*, bearing the same hydroid, *Perigonimus pugetensis*, in Puget Sound but outside the sound the same species of fish was negative. McCormick, *et al.*, (1967) stated that the rate of infection with hydroids was higher in species of fish that migrated to the surface at night.

The purpose of this paper is to describe another hydroid parasitic on a fish. Theodore Pietsch, presented a lantern fish, *Cerattias holboelli* Krøyer, 1844, about 15 cm long, that had a small patch of tiny, finger-like polyps dorsal and slightly anterior to the left eye (Fig. 1). This fish was collected with an Isaacs-Kidd midwater trawl at a depth of about 95 meters off the leeward side of Oahu, Hawaii on March 1, 1971. A few polyps were stained with Mayer's paracarmine and mounted in Canada balsam. A portion of the colony was sectioned, stained with hematoxylin and triosin and mounted in Canada balsam. Drawings were made with the aid of a camera lucida unless

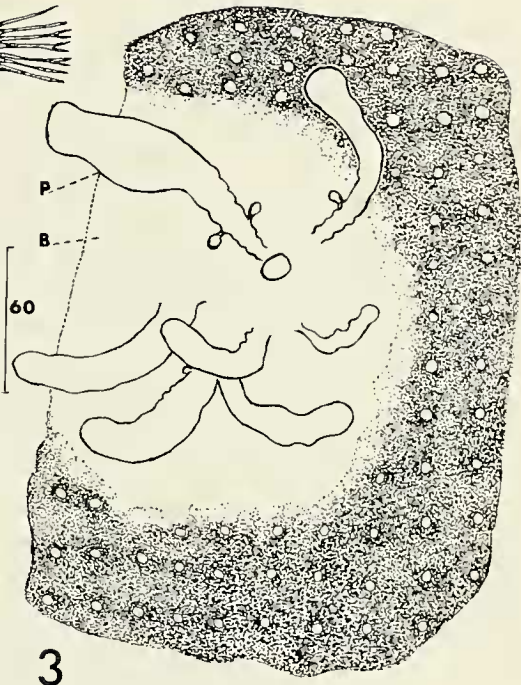
Figure 1. Sketch of *Cerattias holboelli*, C, location of coelenterate colony; E, eye. Figure 2. Section of uninfected fish skin, EP, pigmented epidermis; S, spine-like scale. Magnification scale same as figure 4. Figure 3. Part of coelenterate colony and surrounding host skin, B, basal plate; P, polyp. Figure 4. Section through part of basal plate and host skin, I, inner ectoderm; O, outer ectoderm; S, spine-like scale; T, host cell response. Figure 5. Optical section of bud and stalk, projecting from polyp wall, EC, ectoderm; EN, endoderm.



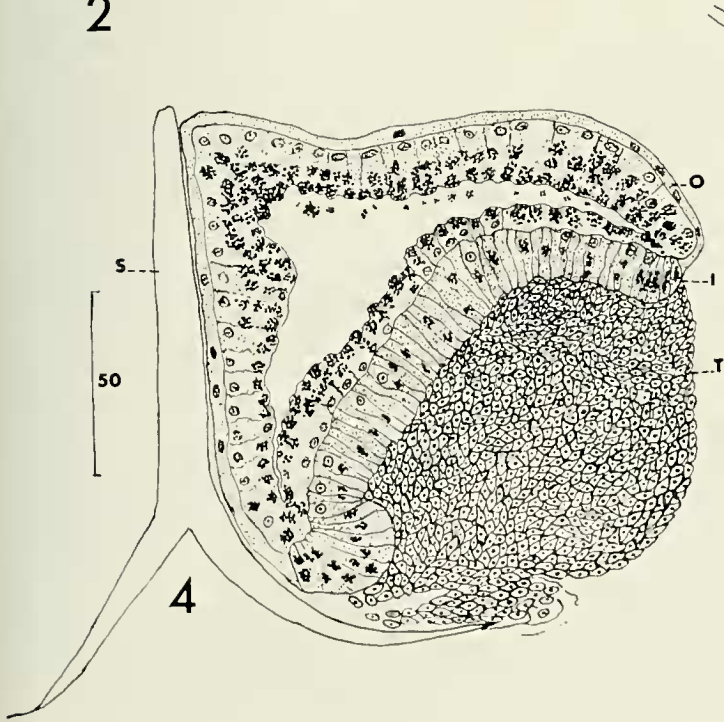
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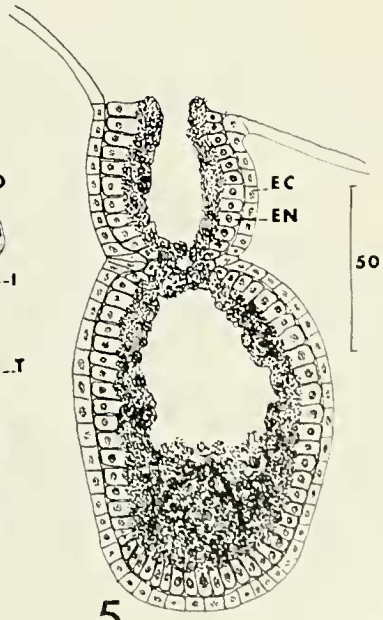
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otherwise indicated. Measurements are expressed in microns unless otherwise indicated.

***Hydrichthys pietschi*, new species**

Figures 3-5

Polyps project from basal plate, some bearing buds on the aboral half of body (Fig. 3). Polyp 490-1,010 long; 112-168 wide. Ectoderm thin (about 3) endoderm 8-9 thick enclosing many granules 0.8-9 in diameter. Nematocysts and mesoglea not seen. Medusa bud (Fig. 5) stalked, 87-106 long, 68 wide. Mass of cells at distal end probably developing manubrium. Bud endoderm also contains granules. Bud stalk 40-50 long; 47 wide.

Basal plate (Fig. 4) approximately 4,800 in diam. with outer thin, 3, and inner thick, 16-22, ectoderm. Thickened inner ectoderm contains granules and may function in digestion as suggested by Damas (1934). Endoderm thickness 8-25, with numerous granules, encloses shallow gastrovascular cavity. Maximum plate thickness 137 which is about equal to the greatest penetration into the host. In this penetration the pigmented epidermis and some of the underlying tissues of the host are eroded. The granules of the hydroid and of the host epidermis are very nearly the same size. Possibly the hydroid obtains its granules from the host. There is a definite tissue response of the host to the parasite with a massing of cells beneath the inner ectoderm (Fig. 4) which is not seen in uninfected skin (Fig. 2).

Host: *Ceratias holboelli* Krøyer, 1844.

Habitat: Skin.

Type locality: Leeward side of Oahu, Hawaii.

Holotype: No. 7115, deposited in the Hancock Parasitology Collection, University of Southern California.

DISCUSSION

Hydrichthys pietschi differs from other members of the genus in apparently lacking nematocysts and mesoglea, in having a thicker inner ectoderm of the basal plate, and in a deeper penetration of the host. The only other report of a hydroid on a myctophid fish is that of McCormick, *et al.*, (1967), a species which has a thick mesoglea, a thinner inner ectoderm and only slight invasion of the host.

After this paper was accepted for publication, *Polypodium sp.* was reported in *Acipenser fulvescens* collected in the Black River near Cheboygan, Michigan (Hoffman, Raikova, and Yoder. J. Parasit., 60:548-550. 1974).

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INFESTATION OF THE SANDY BEACH AMPHIPOD *ORCHESTOIDEA CORNICULATA* BY *GAMMARIDACARUS BREVISTERNALIS* (ACARI: LAELAPTIDAE)

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ABSTRACT: The mesostigmatid mite, *Gammaridacarus brevisternalis* has been found on both decomposing wrack and on the beach amphipods *Orchestoidea corniculata* and *O. californiana*. The percentage infestation of the host population increased with size of hosts and varied from 1.5 percent (hosts 3-7.9 mm) to 83.07 percent (hosts 16-19.9 mm). Mites showed no preference for male or female hosts. The number of mites per infested host increased slightly with amphipod size. Mites were found attached by gnathosoma exclusively on the ventral side of the host. The mites left hosts within 2-9 hours after death of the host and mites without hosts can crawl over sand at an average rate of 3 inches per minute. After leaving dead hosts, *G. brevisternalis* attach to new, living hosts. The mites traveled at least 30 cm in finding new hosts and observations suggest that the mites possess chemotactic senses for locating hosts at a distance.

In California sandy beach communities, members of the amphipod genus *Orchestoidea* are among the most abundant macrofauna. At night these beach hoppers leave their sand burrows and feed in large numbers on stranded seaweed. As early as 1912 small, apparently ectoparasitic mites had been found on these gammarids (Hull, 1912), and in later studies of *Orchestoidea* both McClurkin (1953) and Bowers (1954) noted

their occurrence. In Oregon and Washington, Canaris (1962) found *Orchestoidea californiana* Brandt, 1851, infested with males, females, and deutonymphs of a mesostigmatid mite which he named *Gammaridacarus brevisternalis* Canaris.

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